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NOTES ON FRESH-WATER FISHES FROM MEXICO AND CENTRAL AMERICA

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NOTES ON FRESH-WATER FISHES FROM MEXICO AND CENTRAL AMERICA.

By SETH EUGENE MEEK.

During the past year and a half the Museum has received from Mexico and Central America several collections of fresh-water fishes. The Central American countries represented are Guatemala, Beliz, Nicaragua and Costa Rica. In the following paper those from each country are listed separately. The largest collections are from Guatemala and are listed first. These collections were made during January and February, 1906, as follows: Collections made by the writer are from the Motagua River at El Rancho, Lake Amatitlan, Mazatenango San José del Idolo and Caballo Blanco; a collection made by Dr. N. Dearborn, Rio Motagua, Los Amates; a collection made by C. M. Barber in Lake Atitlan.

The Rio Motagua at El Rancho and at Los Amates flows with a swift current over sandy and rocky bottom. It is a large stream, but does not appear to be well supplied with fishes, especially in its upper course. Its fishes were studied some two years ago by Newton Miller*, who has given an excellent account of the ichthyology of this river, which is the largest one in the Republic.

The water-courses visited by the writer at Mazatenango and San José del Idolo, are swift mountain streams, flowing for the most part over rocky bottoms. The Rio Tilapa at Caballo Blanco drains the western slope of the volcano Santa Maria, and since the eruption of 1902 it has been almost without fishes. At Caballo Blanco this river is very wide, but averages in February less than a foot in depth. It is overloaded with sediment from the ashes thrown out during that eruption. A collection of fishes was made in the Rio Isquia a short distance south of Caballo Blanco. In these the current was sluggish, and fishes were more abundant in them than in the waters of the higher lands. The physical features and the biology of the lakes Amatitlan and Atitlan will be described in a paper now in preparation. The study of these lakes was made under the patronage of the Guatemalan government.

I wish to acknowledge my indebtedness to Mr. Combs, U. S. Minister to Mexico, his secretary, Mr. Brown, and to Mr. Winslow, U. S.

*Bull. Amer. Mus. Nat. Hist., 1907, pp. 95-124.

Consul General, for many courtesies; also to Mr. Hodgson, General Manager, and Mr. Tisdal, Assistant General Manager of the Guatemala Central Railroad, who very materially aided me in transportation.

Family **Siluridae**.

Rhamdia parryi (Eigenmann).

Head 4.1 to 4.3 in length of body; depth 4.5 to 4.8; snout to dorsal 2.7 to 2.8; length of adipose fin 3.3 to 3.6; snout 2.4 to 2.8 in head; interorbital 3.3 to 3.6; diameter of eye 4.5 to 4.8; pectoral spine 1.8 to 1.9; base of anal 1.3 to 1.6; least depth of caudal peduncle 2.3 to 2.4; anal rays 10 or 11; maxillary barbels reaching to middle of base of dorsal fin. Sides with a dark lateral band.

Caballo Blanco (5), 85 to 126 mm.; San José del Idolo (1), 130 mm.

Rhamdia cabreræ Meek.

This species much resembles the preceding. It has a shorter head, a more slender body, a less elevated dorsal region, and shorter fins. The maxillary barbels are much shorter, their tips seldom reaching base of pectoral spine, and not to its middle.

Lake Amatitlan (36), 75 to 145 mm.

Rhamdia godmani (Günther).

Head 2.25; depth 5.45; D. 1.7; A. 10; snout to dorsal fin 2.88 in body; length of adipose fin 2.72; maxillary barbels reaching slightly past origin of adipose fin; base of dorsal 1.83 in head; its height 1.68; height of adipose fin 7.45; base of anal 2.90; pectoral spine 2.51; least depth of caudal peduncle 2.58; diameter of eye 6.78; interorbital 2.58; snout 2.45.

Color bluish, ventral region white; a light bar on dorsal fin. This species differs from *Rhamdia nicaraguense*, which it most resembles, in having a longer head.

One specimen from El Rancho, 223 mm.

Family **Characinidae**.

Astyanax æneus (Günther).

Tetragonopterus fasciatus Günther, Cat., v, 322, 1864 (part), Huamuchal; Rio Guacalate; Rio Chisoy, Vera Paz; Mexico; Cordova; Guatemala; Central America.

Tetragonopterus æneus Günther, Proc. Zool. Soc. Lond., 1860, 319, Oaxaca, Mexico: Günther, Cat., v, 326, Oaxaca, Mexico: Meek, Field Col. Mus. Pub., Zool. Ser., v, 86, 1904, Rivers of Isthmus of Tehuantepec on both sides of the divide.

Tetragonopterus microphthalmus Günther, Cat., v, 324, 1864, Lake Amatitlan, Guatemala; Pacific Coast of Guatemala; Rio Rimac.

Tetragonopterus humilis Günther, Cat., v, 326, 1864, Lake Amatitlan, Guatemala.

This species is exceedingly variable. In the material listed below I am unable to recognize but one species.

El Rancho (80), 70 to 130 mm.; Los Amates (35), 55 to 85 mm.; Lake Amatitlan (46), 50 to 120 mm.; San José del Idolo (35), 55 to 120 mm.; Caballo Blanco (43), 55 to 110 mm.

Rœboides guatemalensis (Günther).

This species is quite abundant in lowland streams or bayous where there is little or no current.

San José del Idolo (100), 40 to 60 mm.; Caballo Blanco (17), 55 to 85 mm.

Brycon dentex Günther.

None of the specimens taken by me was large.

El Rancho (45), 43 to 123 mm.; Los Amates (2), 80 to 90 mm.

Family **Gymnotidæ.**

Gymnotus carapo Linnæus. ANGUIA.

Two specimens from outlet of Lake Amatitlan are much darker than a single individual in the collection from Los Amates taken by Miller.

Los Amates 170 mm., head 8.50; depth 10.00 in total length; snout 2.79 in head; interorbital 2.67; greatest width of head 1.54.

Outlet of Lake Amatitlan 146 mm.; head 8.14 in total length; depth 9.15; snout 3.00 in head; interorbital 2.47; head 8.30 in total length; depth 8.00; snout 2.77 in head; interorbital 2.38; greatest width of head 1.43.

These two specimens from Amatitlan are of a dark brownish color, the smaller one has a few darker markings on ventral region, while the

larger one is profusely covered with small dark spots. One specimen from Los Amates, Guatemala, is of a very light uniform color. No dark or light bars are present on any of these specimens. Two specimens in the Museum collection from South America have quite a different coloration; one is a very dark brownish color crossed by narrow yellowish bars, which are less than half as wide as the interspaces; on the other the yellow bars are much wider and nearly as wide as the interspaces. The darker bars are more or less interrupted by partial light yellow bars.

This species is reported as very scarce in the head of the outlet of Lake Amatitlan. It is very tenacious of life and so is prized for the aquarium. It is also regarded as a very superior food fish.

Family Poeciliidae.

Fundulus punctatus (Günther). JULUMINA.

Head 3.4 to 3.8; depth 3.4 to 3.5; D. 12 to 13; A. 14 to 15; scales 10-32. Body elongate, somewhat robust; snout 3.4 to 3.6 in head; interorbital area slightly convex, its width 2.1 to 2.2 in head; diameter of eye 3.4 to 3.6; origin of dorsal to tip of snout 1.3 to 1.5 in body; base of dorsal 1.7 to 2.1 in head; base of anal 1.6 to 2.0; pectoral not reaching ventrals, 1.6 to 1.8 in head; ventrals reaching slightly more than half way to anal, 2.3 to 2.5 in head; length of caudal peduncle 1.5 to 1.6 in head, its least depth 1.7 to 1.9 in head.

Color dark olivaceous; a rather indistinct dark lateral band, most conspicuous on posterior half of fish, many of the scales on posterior half of body each with a dark spot, making the caudal peduncle irregularly spotted; two rows of spots on dorsal near its base, the rest of the fin irregularly covered with small black spots; proximal half of caudal fin with small black spots; other fins pale, unspotted.

Mazatenango (7), 60 to 100 mm.; San José del Idolo (2), 65 to 70 mm.

Fundulus guatemalensis Günther. JULUMINA.

Fundulus guatemalensis Günther, Fishes Cent. Amer., 482, pl. LXXXIV, figs. 3 and 4, 1869, Lake Dueñas; Amatitlan; Rio Guacalate.*

Fundulus pachycephalus Günther, l. c., 482, pl. LXXXIV, fig. 6, Lake Amatitlan.

*Probably *Fundulus punctatus*.

This species much resembles the former. It differs from that species in having a deeper and more robust body and in having a more uniform coloration. In this species the lateral band is less prominent and there are no, or very few, spots on caudal peduncle and none on dorsal and caudal fins. Head 3.4 to 3.6 in body; depth 2.9 to 3.1; origin of dorsal to snout 1.3 to 1.5; snout 3.4 to 3.6 in head; diameter of eye 3.4 to 3.6; interorbital 2.1 to 2.2; base of dorsal 1.7 to 2.1; base of anal 1.6 to 2.0; pectoral 1.6 to 1.8; ventral 2.3 to 2.5; length of caudal peduncle 1.5 to 1.6; depth of caudal peduncle 1.7 to 1.9; scales 11-35.

Lake Amatitlan (53), 50 to 90 mm.; Atitlan (1) 54 mm.

Gambusia fasciata Meek.

Abundant in lowland streams near Caballo Blanco. The vertical bands on sides vary from 4 to 9.

Caballo Blanco (100), 40 to 70 mm.

Heterandria pleurospilus (Günther).

Very abundant in lowland streams. The large black spots on the sides distinguish this species from *H. lutzi*, which it most resembles. This species is only known from the western slope of Isthmus of Tehuantepec and Guatemala.

Mazatenango (75), 33 to 60 mm.; San José del Idolo (180), 30 to 75 mm.; Caballo Blanco (18), 35 to 75 mm.

Heterandria lutzi Meek.

Mr. Miller found this species to be very abundant in the lower course of the Rio Motagua. It is not known to occur on the Pacific slope.

El Rancho (24), 30 to 75 mm.

Pœcilia sphenops Cuvier & Valenciennes. PESCADITO.

Pœcilia sphenops Cuvier & Valenciennes, Hist. Nat. Poiss., XVIII, 130, 1846, Vera Cruz: Günther, Cat., VI, 344, 1866, Vera Cruz: Garman, (part) Mem., Mus., Comp. Zool., 1895, 59, pl. iv, fig. 13, Mexico and Central America: Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, 694: Meek, Field Col. Mus. Pub., Zool. Ser., v, 153, 1904, Monterey and Rio Balsas to Isthmus of Tehuantepec: Miller, Bull. Amer. Mus. Nat. Hist., 1907, 107, Rio Motagua from El Rancho to its mouth.

Molienisia fasciata Müller & Troschel, Mon. Akad. Wiss., Berlin, 1844, 36, Mexico.

Gambusia modesta Troschel, Müller's Reise in Mexico, iii, 639, 1865, Mexico.

Pacilia mexicana Steindachner, Sitzber. Akad. Wiss., Wein, 1863, 178, Southern Mexico: Günther, Cat., vi, 340, 1866, Chiapam; Dueñas; River Choiso, Vera Paz; Lake Amatitlan: Jordan & Evermann, l. c. 692: B. A. Bean, Proc. U. S. Nat. Mus., 1898, Santa Maria, Vera Cruz.

*Pacilia thermalis** Steindachner, Akad. Wiss., Wein, 1863, 181, Warm springs in Central America.

Pacilia chisoyensis Günther, Cat., vi, 342, 1866, River Choiso, Vera Paz: Jordan & Evermann, l. c., 693.

Pacilia petenensis Günther, Cat., vi, 342, Lake Peten: Jordan & Evermann, l. c., 694.

Pacilia dovii Günther, Cat., vi, 344, 1866, Lake Nicaragua; Lake of Amatitlan: Gill & Bransford, Proc. Acad. Nat. Sci. Phila., 1877, 183: Jordan & Evermann, l. c., 695.

Pacilia limantouri Jordan & Snyder, Bull. U. S. Fish Comm., 1900, 129, fig. 10, Rio Tamesin, Tampico: Jordan & Evermann, l. c., 1900, 3153: Fowler, Proc. Acad. Nat. Sci. Phila., 1903, 320, Victoria, Tamaulipas.

Pacilia butleri Jordan, Proc. U. S. Nat. Mus., 1888, 330, Rio Presidio, near Mazatlan: Jordan & Evermann, l. c., 691: Evermann & Goldsborough, Bull. U. S. Fish Comm., 1902, 151, Salt water in Gulf of Tehautepec, Salina Cruz: Meek, Field Col. Mus. Pub., Zool. Ser., v., 151, 1904.

This species is extremely variable, and is widely distributed. It is found in salt, brackish and fresh water, its vertical range is from sea level to over 6000 feet in Guatemala. Where found it is extremely abundant. It occurs in low, stagnant pools to swift mountain streams. This species is often reported to live in hot springs, and to exist in water near the boiling point. At Laguna, on Lake Amatitlan, are a number of hot springs at the water's edge. The discharge from these springs forms a rather thin layer of hot water on the surface for a distance of about 15 meters from the spring. As these fishes approach within a meter or so of the spring they have the appearance of swimming in very hot water. The temperature of the water on the surface is scalding hot, while the stratum below is less than 90° F. It is in this

*The specimens from San Salvador, warm springs, recorded by Dr. Günther (Cat., vi, 341, 1866) under this name have been made the basis of a new species, *Pacilia salvatoris* (Ann. & Mag. Nat. Hist., 1907, 65) by Mr. Regan.

lower, cooler stratum that these fishes are found. Mr. Smith of Ohio University caught a lot of these fishes one day and placed them in the hot water of the spring. All of them were killed soon after striking the hot water. These fishes are abundant in the warm water near springs, where they feed on the abundant algae there. It is doubtful if they ever for any length of time endure a temperature of more than 100° F. In Guatemala City I was unable to secure a thermometer which would register over 110° F. and so was unable to take the temperature of these springs. In many places near the springs one could quickly plunge his hand into the water and easily demonstrate that the surface water was too hot for comfort, while the temperature of the water beneath was not much warmer than that out in the lake. The water in the spring was warm enough to scald chickens, and it would cook eggs soft in about 6 to 8 minutes and fairly hard in about 15 minutes. In water of this temperature, and even much cooler, fishes could not live.

Some time since I asked Mr. Regan to examine the types of the several apparently nominal species described by Dr. Günther. This he kindly did, and in arranging the synonymy above I have not departed much from the results of his study of this species. The family to which this species belongs is being monographed by Mr. Regan.

El Rancho (85), 29 to 53 mm.; Lake Amatitlan (200), Lake Atitlan (100), 40 to 95 mm.; San José del Idolo (40), 55 to 110 mm.; Caballo Blanco (21), 50 to 90 mm.

Family **Atherinidæ.**

Thyrina meeki Miller.

A few individuals of this species were taken in the current of the Rio Motagua at El Rancho.

El Rancho (15), 40 to 95 mm.

Family **Mugilidæ.**

Agonostomus monticola (Bancroft). TRUCHA.

This species is quite common in clear, swift, rocky streams, many can be seen among the boulders but their capture is difficult.

San José del Idolo (1), 82 mm.

Family **Centropomidae**.**Centropomus nigrescens** Günther.

Caballo Blanco (15), 50 to 135 mm.

Family **Lutianidae**.**Neomænis argentiventris** (Peters).

One small specimen taken in fresh water. Color in life red, in spirits a nearly uniform reddish-brown, lighter in ventral region. Head 2.53; depth 2.53; D. x. 16; A. iii, 8; scales 50; 7 rows of scales between dorsal fin and lateral line; maxillary reaching to anterior margin of pupil, its length 2.62 in head; mandible 1.94; snout 3.48; diameter of eye 3.06; interorbital 5.86; longest dorsal spine 2.35; second anal spine 2.23; pectoral reaching slightly past vent, 1.27 in head.

Caballo Blanco (1), 70 mm.

Family **Cichlidae**.**Cichlasoma macracanthum** (Günther).

San José del Idolo (1), 50 mm.; Caballo Blanco (2).

Cichlasoma centrale Meek.

Caballo Blanco (1), 103 mm.

Cichlasoma trimaculatum (Günther).

This species has a deeper and more compressed body than that of *Cichlasoma mojarra* Meek. It also has a less pointed snout, smaller mouth, shorter anal base, a narrower preorbital, larger eye, higher dorsal and anal fins, longer pectoral fins, and a deeper caudal peduncle. The dark vertical bars on posterior half of body are also more prominent. The following is a comparison of three specimens of nearly equal size of each of these two species.

C. trimaculatum: Total length 171 to 200 mm. Head 2.3 to 2.6;

depth 1.8 to 1.9; preorbital 5.6 to 5.7 in head; eye 3.8 to 4.3; last dorsal spine 2.3 to 2.5; last anal spine 2.3 to 2.5; pectoral 1.2 to 1.3; length of caudal peduncle 4.0 to 4.2, its depth 2.1 to 2.2; D. xvi to xviii, 11 or 12; base of anal 3.1 to 3.3.

C. mojarra: Total length 200 to 241 mm. Head 2.5 to 2.6; depth 2.1 to 2.2; preorbital 4.9 to 5.1 in head; eye 4.5 to 4.9; last dorsal spine 2.8 to 2.9; last dorsal spine 2.7 to 2.9; pectoral 1.2 to 1.3; length of caudal peduncle 3.6 to 4.0, its depth 2.4 to 2.6; D. xvii or xviii, 11; A. vii, 8; base of anal 3.5 to 3.6 in body.

Caballo Blanco (4), 100 to 205 mm.

***Cichlasoma guttulatum* (Günther).**

This species is quite abundant in Lake Amatitlan. It is the largest fish in the lake and the one most prized for food.

Mr. Regan in his account of this family in the Biol. Cent.-Amer., 20, suggests that *Cichlasoma zonatum* Meek may be identical with this species. It is, however, a much deeper fish; depth 2.11; depth 2.4 to 2.6 in *C. guttulatum*. In *C. zonatum* the profile is much steeper, the dorsal region more elevated, and the mouth smaller and more inferior, than in *C. guttulatum*. In *C. zonatum* the dorsal formula is D. xvii, xviii-10 or 11; anal vi, 8 or 9. In the original description the dorsal rays are erroneously given as 6.

Lake Amatitlan (100), 70 to 220 mm.; San José del Idolo (4), 50 to 95 mm.; Caballo Blanco (7), 50 to 165 mm.

***Cichlasoma maculicauda* Regan.**

Cichlasoma manana Miller, Bull. Amer. Mus. Nat. Hist., 1907, 116, Rio Motagua, Algeria; Rio Kilagua, Los Amates; Rio Tenedores.

There is little doubt, as suggested by Miller, of the identity of *C. maculicauda* and *C. manana*. The two specimens examined by me agree well with the description given by Regan and by Miller.

Los Amates (2), 220 and 230 mm.

***Cichlasoma nigrofasciatum* (Günther).**

This species is very abundant in Lake Amatitlan. It is also quite common in Lake Atitlan. It lives near shore in the larger aquatic vegetation, on the tender portions of which it feeds. The inhabitants near Lake Atitlan use them for food. This fish never grows large and being full of small bones it is seldom used for food at Lake Amatitlan.

The absence of better fish is the only excuse for eating it at Lake Atitlan.

Lake Amatitlan (350), 30 to 100 mm.; Lake Atitlan (55), 30 to 100 mm.

***Cichlasoma milleri* sp. nov.**

Type no. 5529, F. M. N. H.; length 195 mm.; El Rancho, Guatemala.

Head 3.0 to 3.2; depth 2.4 to 2.6; D. xvii to xix, 10 to 12; A. vi, 8 or 9; scales 7-32-12. Body oblong, dorsal region little elevated; profile curved, moderately steep, mouth low, moderate; maxillary not reaching vertical from anterior margin of orbit; its length 3.0 to 3.5 in head; lips thick, the lower with margin free, though slightly less free in center than sides; lower jaw slightly the shorter, mandible 2.6 to 2.7 in head; preorbital 3.7 to 4.3; postorbital 2.4 to 2.6; snout 2.1 to 2.5; interorbital 2.6 to 2.9; diameter of eye 3.9 to 4.6; eye to margin of subopercle 2.4 to 2.6; snout to scales on nape 1.8 to 2.3; origin of dorsal to tip of snout 2.4 to 2.5 in body; base of anal 3.9 to 4.2; dorsal spines rather low, the last few spines much the longest; last dorsal spine 2.1 to 2.4 in head, last anal spine 2.1 to 2.4 in head; pectoral and ventral fins short, their tips not reaching to first anal spine; length of pectoral 1.3 to 1.4 in head; ventral 1.3 to 1.4; length of caudal peduncle 2.3 to 2.5 in head, its depth 2.2 to 2.3; caudal fin truncate; no prominent nuchal hump developed on any of the specimens; gill rakers short, 2 + 7.

Color olivaceous, the larger individuals (over 115 mm.) much darker, sides with six dark vertical bars; a dark lateral band prominent on smaller (less than 115 mm.) individuals, not well defined on the larger individuals, no lateral or humeral spot, sides in larger individuals with light lines along the rows of scales; a dark caudal spot; soft dorsal and anal and caudal fins with light and brownish spots; a narrow dark line from end of maxillary on cheek below eye; usually a few dark spots on cheeks. Named for Mr. Newton Miller, who has much increased our knowledge of Guatemalan Fishes.

Rio Motagua, El Rancho, Guatemala (14), 32 to 195 mm. Los Amates, Guatemala (1), 224 mm.

***Cichlasoma elliotti* (Meek).**

El Rancho (13), 30 to 135 mm.

***Cichlasoma montaguensis* (Günther).**

One male 200 mm., three females 115 to 163 mm., eight small ones

33 to 53 mm., the lateral band more prominent on females than on males; females with a dark band downward and backward from eye, also a dark spot at base of pectoral; vertical fins unspotted; male with small black spots on head and on nuchal region; vertical fins profusely spotted. The small specimens have a very distinct lateral blotch, otherwise they resemble the females. The differences in color in the sexes of this species much resemble those in the sexes of *Cichlasoma dovii* Günther of the great lakes of Nicaragua. Mr. Miller* has incorrectly considered this species the same as *Cichlasoma managuensis* Günther, a certainly very different species. This species is close to *Cichlasoma fredrichsthalii* Heckel, with which it has been identified by Mr. Miller.

El Rancho (12), 33 to 200 mm.

Family **Liognathidae**.

Gerres peruvianus Cuv. & Val.

Caballo Blanco (3), 45 to 60 mm.

Eucinostomus californiensis (Gill).

Caballo Blanco (3), 65 mm.

Family **Gobiidae**.

Dormitator maculatus (Bloch).

Caballo Blanco (3), 38 to 45 mm.

Philypnus maculatus (Günther). GUAVINA.

The dark lateral band on these specimens is more distinct than on specimens from the east side; anal fin usually with 10 rays, occasionally 9.

San José del Idolo (1), 190 mm.; Caballa Blanco (25), 45 to 120 mm.

The following list is made up from four small collections from Costa Rica sent to the Museum by Dr. Anastasio Alfaro, Director of the National Museum of Costa Rica. With a few exceptions they are

*Bull. Amer. Mus. Nat. Hist., 1907, 119.

from fresh water. The collections are interesting as coming from a region in which the fishes are little known.

Family Siluridæ.

Rhamdia regani sp. nov. BARBUDO.

Type No. 6019, F. M. N. H.; length 93 mm.; Turrialba, Costa Rica. Head 4.6 to 4.8; depth 5.5 to 5.9; D. 1-6; A. 11 or 12. Body elongate; head flattish above covered with smooth skin; lower jaw slightly the longer; width of head 5.8 to 6.5 in body; snout 2.7 to 2.8 in head; eye small, 4.7 to 5.1 in head; interorbital 2.6 to 2.7; snout to origin of dorsal fin 2.6 to 2.7 in body; occipital process very short; fontanelle present, extending nearly to occipital process, bridge between the eyes; maxillary barbels short, reaching about to middle of pectoral fin; base of adipose fin shorter than its distance from dorsal, its length 4.6 to 5.0 in body, its distance from dorsal 4.3 to 4.5 in body; dorsal spine weak; base of dorsal fin 2.2 to 2.4 in head, its height 1.5 to 1.6; pectoral spine about $\frac{3}{5}$ length of fin, its length 2.8 to 3.0 in head; inner edge of pectoral spine denticulate.

Color greenish olive, head darker, fins all plain. Close to *Pimelodus rogersi* Regan. Dr. Alfaro states that one female of this species contained 6500 eggs. Named for Mr. C. T. Regan of the British Museum, who has much increased our knowledge of tropical American fishes.

Turrialba, 600 meters (12), 75 to 175 mm.; Rio Tiribi, San José (5), 92 to 140 mm.

Rhamdia brachycephalus (Regan).

Turrialba (1), 148 mm.

Family Cyprinidæ.

Carassius auratus (Linnæus). PEZ DORADO.

This species is not a native of Costa Rica. It is the introduced gold fish often seen in aquariums.

Costa Rica, Pacific side (1), 124 mm.; San José (in captivity) (1), 112 mm.

Family **Characinidae**.**Astyanax ærstedii** (Kroyer).

Head 4.16; depth 2.82; base of anal 3.09; anal rays 29; longest dorsal ray equalling length of head; pectoral fin 1.15 in head, its tips reaching ventral; ventrals to anal fin; diameter of eye 2.80 in head; interorbital 2.69.

Color greenish olive, a dark silvery lateral band becoming quite black on its posterior half.

Turrialba, 600 meters (1), 78 mm.; Rio Siguire (1), 115 mm.; Rio Machuca, 200 meters (1), 116 mm.

Astyanax æneus (Günther). SARDINIA.

Head 4.15; depth 3.19; base of anal 3.60; anal rays 25; longest dorsal ray 1.11 in head; pectoral fin 1.25 in head, its tip not reaching ventrals. Ventrals not to anal fin; diameter of eye 3.33 in head; interorbital 2.50.

Color olivaceous, lateral band bluish silvery, not darker on its posterior half.

Costa Rica, Pacific side (1), 83 mm.; Rio Siguare, Turricares (1), 94 mm.

Rœboides guatemalensis (Günther).

Santo Domingo, 200 meters (2), 103 and 110 mm.

Family **Poeciliidae**.**Rivulus flabellicauda** Regan. BARBUDO ROQUERO; RIMORA.

Centers of scales the darker; fins uniform dark, without dark spots; caudal oculus present.

Mr. Regan's description of this species is so brief that I make this identification with some doubt.*

El Guayabo (3), 54 to 63 mm.

Gambusia annectens Regan. OLOMINA.

Type No. 6025, F. M. N. H.; length 50 mm.; Turrialba, Costa Rica.

Head 3.8 to 3.9; depth 3.3 to 3.6; D. 9 or 10; A. 8 or 9; scales 31. Body

*The specimen described by me as *Cynodontichthys* (misprinted *Cynodonichthis*) *tenuis*, Field Col. Mus. Pub., Zool. Ser., v, 101, is apparently a *Rivulus*.

rather robust; top of head nearly flat; interorbital 1.7 to 1.8 in head; snout 3.7 to 4.0; diameter of eye 2.5 to 2.7; origin of dorsal slightly behind that of anal, and slightly nearer tip of caudal than end of snout; midway between base of caudal and base of pectoral fin, its distance from tip of snout 1.5 to 1.6 in body; pectoral fin reaching slightly past base of ventrals, 1.3 in head; depth of caudal peduncle 1.5 in head.

Color greenish olive, middle of each scale with a dark spot forming longitudinal lines along rows of scales; females with no bars or lateral band; males with a broken lateral band crossed by rather indistinct bars; dorsal fin in both sexes with a row of black dots near its base, and with second row at about basal third of fin, other fins plain. Among the specimens from San José are two males, length of each 31 mm.; anal fin very long, 2.46 in body. The smallest female in the collection is 37 mm. in length. Dr. Alfaro states that this species feeds on the larvæ of mosquitoes.

Turrialba, 600 meters (1), 50 mm.; Pacific side (2), 45 mm.; San José (16), 31 to 58 mm.; Quebrada de los Negros (1), 59 mm.; San Isidro (1), 56 mm.

Gambusia terrabensis Regan. OLOMINA.

Type No. 6227, F. M. N. H.; length 52.5 mm.; Los Canas, Alajuela, Costa Rica.

Head 4; depth 3.3; D. 10; A. 8; scales 28. Body robust; top of head flat; interorbital 1.7 in head; snout short 3.7 in head; diameter of eye 2.9; origin of dorsal over that of anal, its distance from tip of caudal slightly greater than from tip of snout; its distance from tip of snout 1.7 in body; pectoral not reaching ventrals, 1.3 in head; depth of caudal peduncle 1.5 in head.

Color greenish olive, edges of scales black; no trace of lateral band or bars; dorsal fin with interradiat membranes black; anal fin with a black spot on base of its middle 5 rays to tip of 2d and 3d rays, other fins plain. Except in color markings this species much resembles the former. Los Cañas, Alajuela, Costa Rica, 900 meters (5), 52.5 and 55 mm. Collected June 19, 1907.

Platypæcilus tropicus sp. nov.

Type No. 6027, F. M. N. H.; length 63 mm.; Turrialba, Costa Rica.

Head 3.6 to 3.8; depth 3.2 to 3.5; D. 9 or 10; A. 8; scales 28. Body robust; dorsal region slightly elevated; top of head slightly convex; interorbital 1.9 to 2.0 in head; snout 3.6 to 4.0; diameter of

eye 2.5 to 2.7; pectoral reaching nearly to middle of ventrals, its length 1.1 to 1.2; origin of dorsal in advance of that of anal, its distance from tip to snout 1.6 to 1.8 in body; depth of caudal peduncle 1.3 to 1.6 in head; dorsal of male much higher than that of female.

Color light olivaceous; dorsal in female light with a few black dots; other fins plain; dorsal of male nearly uniformly blackish on lower half, then slightly spotted becoming plain on distal fifth; a large black blotch on caudal peduncle extending on proximal half of the caudal fin, other fins plain.

Turrialba, 600 meters (2), 59 and 62 mm.

***Poecilia tenuis* sp. nov. OLOMINA.**

Type No. 6028, F. M. N. H.: length 64 mm.; Tiribi, Costa Rica.

Head 3.8 to 3.9; depth 4.0 to 4.5; D. 8 or 9; A. 7; scales 31. Body elongate slender, much compressed posteriorly; top of head flat, interorbital 1.8 in head; diameter of eye 3.2 to 3.5; snout 3.9 to 4.1; origin of dorsal slightly in advance of anal (in female), its distance from tip of snout 1.7 in body; pectoral reaching middle of ventral, its length 1.1 to 1.2 in head; depth of caudal peduncle 1.5 to 1.6 in head.

Color olivaceous without stripes or bars, a black spot on base of dorsal fin, above which are a few black dots, other fins plain.

Tiribi, 1160 meters (2), 64 and 70 mm.; San José (2), 45 and 55 mm., Rio Maria Aguilar (2), 45 and 50 mm.

Family **Mugilidae.**

***Agonostomus monticola* (Bancroft).**

Head 3.69; depth 3.67; D. iv-1, 8; A. ii, 9; scales 42; maxillary reaching vertical from anterior margin of pupil, its length 3.76 in head; diameter of eye 3.47; distance between origins of two dorsals 1.06 in head; longest dorsal spine 1.57; pectoral reaching slightly past origin of anal fin; lips moderately thick.

Individuals of this species under 80 mm. in length have very thin lips, those longer than 100 mm. have thick lips. The lower jaw becomes shorter in the individuals with the thickest lips. From a considerable series of this species examined by me it appears that the lips thicken and the lower jaw shortens with age. The growth of fishes is not uniform, and one must not expect the largest individuals are al-

ways the oldest. The specimen in the Museum which has the thickest lips is 220 mm. in length, the largest specimen is 240 mm. in length.

Santo Domingo, 200 meters (1), 118 mm.; near Turrialba (1), 98 mm.; El Sardinal, Santa Clara (1), 235 mm.

Joturus pichardi Poey. BOBO.

Very common in the markets.

Reventazon River, Costa Rica, 600 meters (1), 300 mm.; El Sardinal, Santa Clara (1), 270 mm.

Family **Tetraodontidae.**

Eumycterias punctatissimus (Günther).

Isle del Coco (1), 67 mm.

Family **Cichlidae.**

Cichlasoma alfari sp. nov.

Type No. 6032, F. M. N. H.; length 93 mm.; Turrialba, Costa Rica.

Head 2.6; depth 2.4 to 2.6; D. xvii or xviii, 11; A. vi or vii, 8; scales 7 - 32 - 13. Body compressed, elongate, profile moderately convex; mouth small, little oblique, the margin of the upper lip below the level of the eye; lower lips without free margin; snout pointed, 2.3 to 2.6 in head; maxillary 3.3 to 3.4; mandible 2.4 to 2.5; preorbital 3.7 to 4.3; postorbital 2.7 to 2.8; eye 2.9 to 3.1; interorbital 3.2 to 3.5; eye to subopercle 2.6 to 2.9; dorsal fin low, its origin to tip of snout 2.2 to 2.3 in body; base of anal fin 3.4 to 3.7; dorsal spine rapidly increases in size to fourth, the rest of nearly uniform length; last dorsal spine 2.8 to 2.9 in head; last anal spine 2.4 to 2.7; pectorals reaching to second or third anal spine, length 1.3 in head; ventral 1.3; least depth of caudal peduncle 2.8 in head, its length 3.0; scales on cheek in 6 rows; gill rakers short 3 + 9.

Color of type olivaceous, upper half of body with slight traces of vertical bars; a dark band from eye to base of caudal; no lateral spot; a small black spot on upper half of base of caudal fin; sides of head and anterior half of body with many small blue spots; a black blotch on spinous dorsal from fifth to twelfth spine; spinous dorsal

with a narrow light border, probably red in life; a few light spots on spinous dorsal, caudal and anal with dark margin, other fins plain.

This species resembles *Cichlasoma balteatum* Gill & Bransford; it differs from that species in the less convex profile, larger mouth, more pointed snout, and lower spinous dorsal. The dark band on this species is concurrent with lateral line, on *C. balteatum* it is straight. There is no trace of a lateral spot. The color of the spinous dorsal fin, and the blue spots on the body are characters not possessed by *C. balteatum*.

Turrialba, 600 meters (4), 60 to 93 mm.

Family Gobiidae.

Sicydium altum sp. nov. BOQUERDO ROQUERO; RIMORA.

Type No. 6034, F. M. N. H.; length 101 mm.; Turrialba, Costa Rica.

Head 4.42; depth 5.08; D. vi - 1, 10; A. 1, 10; scales 92. Body elongate, subcylindrical; mouth subinferior, horizontal, maxillary scarcely reaching vertical from middle of eye; lower jaw much the shorter; teeth of upper jaw slender, bicuspid; teeth of lower jaw mostly concealed, the larger anterior ones pointed and slightly curved backwards; eyes small, 4.75 in head; interorbital 3.80; snout 2.25; origin of anal fin midway between base of caudal and posterior margin of opercle; occiput with small scales not extending past posterior margin of orbits; pectoral fin broad, shorter than head, its length 1.20 in head; ventral 1.72; dorsal spines not reaching soft dorsal; no naked patch or strip on the abdomen except just behind ventral fins.

Color dark olivaceous, no spots or bars, ventral region lighter, fins all plain except anal rays, which are tipped with black.

Turrialba, 600 meters (1), 100 mm.; El Guayabo (2), 95 and 105 mm.

Family Gobiesocidae.

Gobiesox fulvus sp. nov.

Type No. 6035, F. M. N. H.; length 80 mm.; Isle de Coco.

Head 2.61; depth 6.04; D. 9; A. 7. Body broad anteriorly,

compressed posteriorly; width of head 1.20 in its length; mouth wide, 1.46 in length of head; interorbital 3.20 in head; diameter of eye 5.32; ventral disc broad, subcircular, its length 1.18 in head, its width 1.24; origin of anal fin under middle of dorsal; origin of dorsal slightly nearer base of caudal than base of pectoral, its distance from snout 1.38 in length of body; pectoral fin broad, composed of 20 rays, preopercular spine present, rather weak, concealed by skin.

Color nearly uniform brownish, no spots or bars, a black blotch on anterior rays of dorsal fin; distal half of fin lighter than basal half, caudal and pectoral unicolor, brownish.

Chonophorus transandeanus (Günther).

Scales 63-18.

Rio Machuca (1), 200 mm.

The following is a list of fishes collected in Beliz by Dr. Bailey of Cedar Rapids, Iowa, and sent to the Museum for identification

Family **Siluridæ**.

Rhamdia godmani (Günther).

Head 3.8 to 4.2; depth 4.6 to 5.4; D. 1, 6; A. 10 or 11; snout to origin of dorsal 2.8 to 2.9 in body; base of adipose fin 2.7 to 2.9; snout 2.5 to 2.6 in head; diameter of eye 6.2 to 6.5; interorbital 2.7; base of dorsal fin 1.7 to 1.8; its height 1.6 to 1.7; pectoral spine 2.2 to 2.4; base of anal fin 2.0 to 2.2; caudal peduncle 2.3 to 2.5; last dorsal ray to origin of adipose fin 4.5 to 4.7; humeral process about half length of pectoral fin.

Color dark olivaceous, no lateral band; a light band across middle of dorsal fin.

Beliz (2), 172 and 186 mm.

Family **Characinidæ**.

Astyanax æneus (Günther).

Beliz (17), 75 to 125 mm.

Family **Poeciliidæ.****Belonesox belizanus** Kner.

Beliz (2), 95 and 140 mm.

Pseudoxiphophorus bimaculatus (Heckel).

Beliz (1), 67 mm.

Family **Symbranchidæ.****Symbranchus marmoratus** Bloch.

Beliz (1), 330 mm.

Family **Cichlidæ.****Cichlasoma spilurum** Miller.

Beliz (7), 70 to 100 mm.

Cichlasoma maculicauda Regan.

Head 2.60; depth 1.90; D. xvi, 12; A. v, 8; snout to origin of dorsal 2.46 in body; snout 2.75 in head; preorbital 4.35; interorbital 2.75; maxillary 2.97; mandible 2.72; last dorsal spine 2.04; last anal spine 1.83; pectoral not reaching first anal spine, 1.20 in head; ventral 1.16; length of caudal peduncle 2.97; depth of caudal peduncle 2.20; caudal peduncle with black blotches, no distinct bars.

Beliz (1), 106 mm.

Cichlasoma hedricki Meek.

Beliz (3), 60 to 65 mm.

Cichlasoma acutum Miller.

Beliz (1), 108 mm.

Cichlasoma montaguense (Günther).

Beliz (2), 100 to 105 mm.

We list here a small collection of fishes received from Sr. Dioclesiano Chaves of the National Museum of Nicaragua. A few of these are from Lake Managua, the others from Lago de Asososca and Lago de Guila. The former lake contains fresh water and is reported by Mr. Chaves to be very good to drink. He also states that the fishes from this lake are very good to eat, though the species are few. The red mojarra he says soon loses its color when taken from the water and turns white. Lago de Guila is on the Peninsula of Chiltepe, its water is slightly saline.

Family **Characinidae**.

Brycon dentex (Günther). SABALO.

Lake Managua (2), 310 and 375 mm.

Family **Cichlidae**.

Cichlasoma managuense (Günther). GUAPOTE.

Lago de Guila (1), 300 mm.

Cichlasoma citrinellum (Günther). MOJARRA.

The specimens of this species lately received from Nicaragua, show the same ranges of variation as those collected by myself and treated of in a former paper. These were sent under different local or common names. Those of the ordinary coloration were called "mojarra." The specimens which had the spaces between the dark bars the whitest were either "red banded or white banded mojarra." The very dark specimens were called black mojarra. Some specimens are slender, the distance from origin of soft dorsal to origin of soft anal being quite narrow. This species appears to be very abundant in all lakes in western Nicaragua where fishes are found.

Lago de Guila (5), ("black mojarra") 88 to 180 mm., (7) ("white banded mojarra") 130 to 210 mm., (2), ("red banded mojarra") 45 to 185 mm.; Lago de Asososca (3), "mojarra", 140 mm.; (3), ("red mojarra") 140 to 215 mm.; Lake Managua (9), ("mojarra") 140 to 230 mm.

Cichlasoma rostratum (Gill & Bransford). LARGE MASAMICHE.

These specimens are all males. On all the nuchal hump is well developed. The largest specimen has many small brown spots on

the side under and above the pectorals. The examination of these specimens rather strengthens the belief that this species is based on males alone, the females being *C. longimanus* (Günther). Mr. Chaves says this fish does not come out in abundance till October.

Lake Managua (8), 200 to 260 mm.

Neetroplus nematopus (Günther). SHORT-FACED MOJARRA.

Lago de Guila (1), 88 mm.

Family **Gobiidae**.

Philypnus dormitor Lacépède GUAVINA.

These specimens were quite dark and much mottled. On the larger specimens there is scarcely a trace of the lateral band; even in the smallest it is indistinct.

Lake Asososca (15), 110 to 230 mm.; Lago de Guila (7), 120 to 215 mm.

The following is a list of fishes collected by the writer in Mexico, at San Miguel de Allende, Guanajuato, Jesus Maria, San Luis Obispo, and Roderiquez Nuevo Leon, and by E. Heller and C. M. Barber at Sabinas, Coahuila. San Miguel is on a small stream which flows over a sandy bed into the Rio Lerma. There is a small stream at Jesus Maria which belongs to the Rio Panuco system. It is almost without water during the dry season. At the Hacienda a dam is built across the narrow valley forming above it a small lake. In this 4 species of fishes were taken two of which, (*L. nigrescens* and *A. mexicanus*), belong to the Rio Grande fauna; the other two, (*N. calientis* and *S. atripinnis*), to the fauna of the Rio Lerma. The Rio Sabinas and the Rio Salado flow into the Rio Grande. The fishes taken from these places have all except one, *Cycleptus elongatus*, been previously taken from the Rio Grande or its tributaries in Mexico.

Family **Lepisosteidae**.

Lepisosteus osseus (Linnæus).

Roderiguez (5).

Family **Siluridæ.****Ictalurus punctatus** (Rafinesque). PUYON.

Roderiguez (8), 100 to 165 mm.

Family **Catostomidæ.****Carpiodes microstomus** Meek.

Sabinas (3), 65 to 115 mm.

Carpiodes elongatus Meek. BESUGO.

Roderiguez (3), 130 to 310 mm.

Cycleptus elongatus (Le Sueur).

This fish is nowhere abundant, and has previously been known only from the larger streams of the Mississippi valley. The finding of it in the Rio Grande basin in Mexico considerably extends its known distribution.

Head 3.75; depth 5.15; snout to dorsal fin 2.06; dorsal rays 32; scales 55.

Color uniformly light olive; lower two-thirds of tail black.

Roderiguez (3), 48 to 52 mm.

Moxostoma congestum (Baird & Girard).

Sabinas (4), 43 to 53 mm.

Family **Cyprinidæ.****Pimephales notatus** Rafinesque.

Sabinas (4), 40 to 53 mm.

Leuciscus nigrescens (Girard).

San Miguel (2), 115 to 125 mm.; Jesus Maria (70), 55 to 75 mm.

Notropis braytoni Jordan & Evermann.

Sabinas (15), 45 to 65 mm.

Notropis calientis Jordan & Snyder.

San Miguel (34), 45 to 63 mm.; Jesus Maria (60), 35 to 45 mm.

Notropis lutrensis (Baird & Girard).

Roderiguez (23), 45 to 50 mm.

Notropis santarosaliæ Meek.

Roderiguez (21), 50 to 65 mm.

Hybopsis æstivalis (Girard).

Roderiguez (41), 50 to 60 mm.

Family **Characinidæ.****Astyanax mexicanus** (Filippi).Jesus Maria (8), 60 to 90 mm.; Roderiguez (49), 55 to 75 mm.;
Sabinas (8), 45 to 60 mm.Family **Dorosomidæ.****Dorosoma exile** Jordan & Gilbert.

Sabinas (20), 45 to 90 mm.; Roderiguez (1), 165 mm.

Family **Pœciliidæ.****Characodon variatus** Bean.

San Miguel (290), 35 to 70 mm.

Gambusia affinis (Baird & Girard).

San Miguel (60), 30 to 50 mm.

Goodea atripinnis Jordan.

Jesus Maria (175), 30 to 50 mm.; San Miguel (19), 33 to 75 mm.

Family **Atherinidæ.**

Chirostoma arge (Jordan & Snyder).

San Miguel (47), 33 to 75 mm.

Family **Scienidæ.**

Haploidonotus grunniens Rafinesque. MATALOTE.

Roderiguez (7), 145 to 260 mm.

Family **Centrarchidæ.**

Lepomis pallidus (Mitchill).

Sabinas (50), 40 to 110 mm.; Roderiguez (12).

Lepomis megalotis (Rafinesque).

Sabinas (6), 75 to 105 mm.; Roderiguez (2), 93 mm.

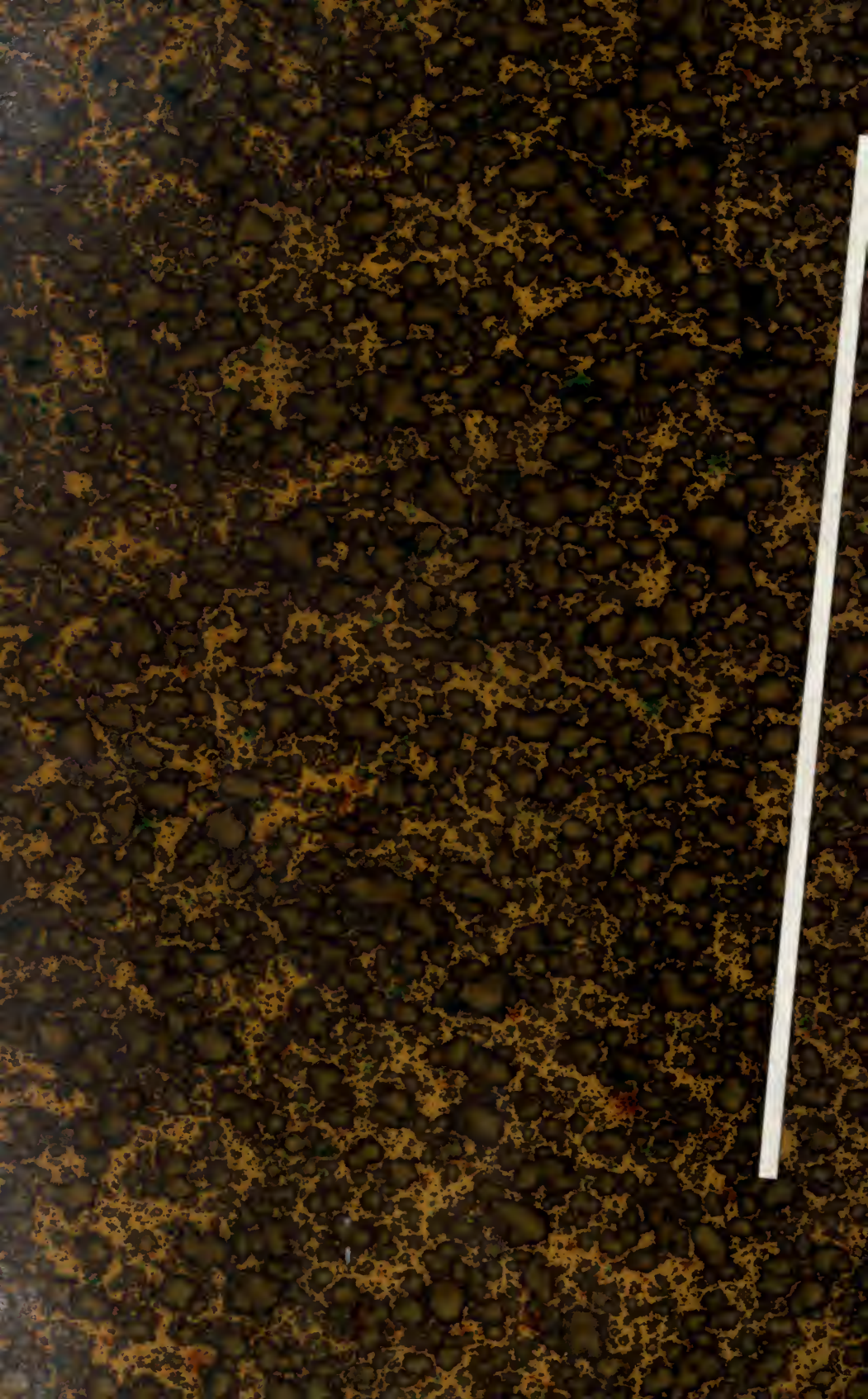
Family **Cichlidæ.**

Cichlasoma cyanoguttatum (Baird & Girard).

The dentition of this species varies greatly, especially so if we consider *Neetroplus carpintus* Jordan and Snyder identical with it. In my account of the genus *Neetroplus* (Field Mus. Pub., Zoöl. Ser., V., 221) I called attention to the fact that the incisor teeth of *N. carpintis* were not always evident. Owing to the variation in color and form as well as in dentition, I am inclined to believe Mr. Regan is correct in combining these two supposed species. The smallest specimens (50 mm.) usually have pointed conical teeth. Other specimens (100 to 150 mm.) may have very few incisor-like teeth while in others of the same size these teeth are quite evident. For fishes of the length

of 150 mm. it is difficult to say which is the oldest because they grow so irregularly. The incisor-like teeth have the appearance, however, of becoming more developed in this species with age, though perhaps very irregularly so. I do not believe that we can retain the genus *Herichthys* on the character of dentition alone. The genus *Neetroplus* is based on the incisor-like teeth of *N. nematopus*, but these flat truncate teeth are quite different from the more or less compressed truncate or rounded anterior teeth which we usually find in many of the larger individuals of the species in question. So far as I have studied them, by far the larger number of the *Cichlasoma* appear to have a quite uniform and regular dentition. The teeth in the young are conical and pointed, while usually in the larger and apparently older individuals some or all of them are more or less blunt at the tips. To give this character specific or generic value one must distinguish between teeth which are worn or changed by age, and those whose structure is constant, but to do this is very difficult.

Roderiguez (5), 30 to 55 mm.



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